Restoring faded patterned pictures
By J. Clement

Picture fading is common, and in some eras photo-processors printed on paper with a patterned surface. The patterning or matte surface was designed to reduce reflections, but in the process it also reduced detail.   Here is an example of restoring a picture from the mid 1970s with those and other problems. The original picture was taken with a flash unit that probably was too close to the lens. This allows reflections from dust in front of the lens, which creates white spots. Here is a copy of the original 3.4 inch square picture before any processing.

The fading to magenta was moderately severe and the picture looked worse to the eye. Most scanners have color restoration filters built into their software. To use it you have to carefully adjust the scanned are to include only part of the picture. The result was:

The background is darker, the colors better and the reddish cast has been removed. The flash spots have also been brought out. However inspecting it at high resolution one can clearly see the patterning which can smear the picture if you want to have an enlargement. The patterning can be seen at high resolution.


Since I knew the picture had patterning I had scanned it at 1200dpi to facilitate editing. The pattern can be removed using an FFT (Fast Fourier Transform) program. There are several that are obtainable for free or low cost. Having tried a number of them, most just reduce the patterning. A new program called "Affinity Photo" can completely remove the patterning. To do this:

1. Select the photo
2. Click on Filters/noise/fft denoise
3. You will see a black and white image with a number of bright spots.
4. Set the size of the tool a bit smaller so the spots fit inside.
5. Then blacken the spots, but NOT the center spot
6. Be sure to blacken all the spots you see.
7. Often the spots on the axes are hard to see. The geometrical pattern can be helpful in finding them.
8. If there are still lines in the photo, try a slightly larger tool width.
9. The spots may be impossible to see in a B&W photo, in which case Neat may work.
10. Click on Apply and the patterning will be gone

There is a free alternative "ImageJ".   ImageJ is not quite as convenient because you have to blacken all of the spots. Affinity conveniently blackens the companion symmetrical spot automatically. Affinity also shows the result in almost real time. If you wait a short time the original image shows the results, while ImageJ only shows the results after you do an inverse FFT. Affinity only shows the FFT map in small size but ImageJ can enlarge it to make spot removal easier. Affinity sometimes does not show the white spots for B&W photos, but with zoom ImageJ works fine. ImageJ remembers the brush size, but Affinity does not. The save function in Affinity creates a proprietary format, but Export creates standard formats. Both of these programs have other editing features that were not tested. If there are still horizontal lines after inverse FFT processing, increase the blackened spot size on the vertical axis.

Often these programs leave lines at the edges of the photo. These can be removed by hand with a scratch remover tool. Since the lines are at the edge, they may not be obtrusive, so removal is optional.

Here is what the partially blackened patterning looks like
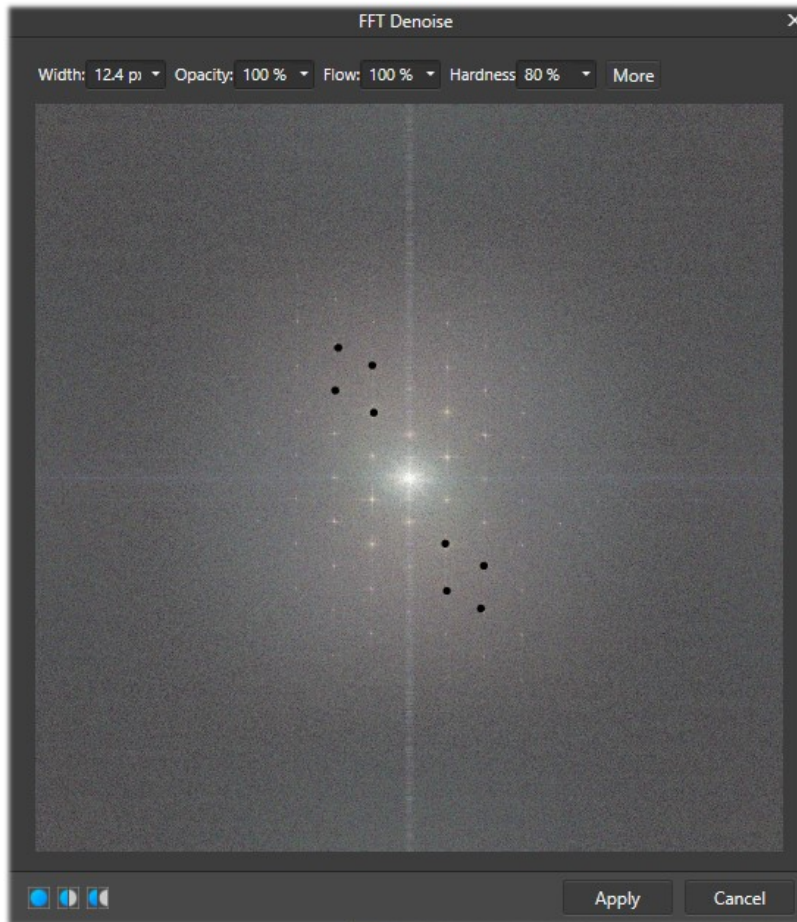
The enlarged portion of the picture now looks like:

At this point careful examination reveals a number of white dots. Removing them increases the contrast and removes some of the haze. There are a variety of filters that might be used, but I used a plug-in "Focus Magic". It can refocus pictures as well as remove dust and dirt. It also can remove camera shake. I set refocus to old film camera, width=12, Amount of focusing=0%, spot removal to light spots. This is the result, which is subtle, but a number of small spots have been removed.

At this point it needs to be refocused, but Focus Magic works best if it does not have to work too hard. So the picture was reduced to half size or 600dpi. Then Focus Magic could readily fix the fuzziness. This required several passes. The automatic detection indicated a width of 7 would work. The following sequence was followed:

1. Film camera, width 7
2. Film camera, width 4
3. Film camera, width 12, Amount=25%, spot removal (try different settings)

Focus Magic can give you better sharpness in multiple passes, but when the first pass is large, wide dark lines tend to be dark in the center and light on the edges. Often there is a fuzzing around outlines. The final pass at 25% fixes these problems. The actual number of passes and settings depend on your original picture. You must experiment to see what works best.

The last chore is to get rid of the white spots. I use Paint Shop Pro which has many Photoshop features at an affordable price. It has an adjustable width scratch remover which removes spots and scratches like magic as long as you do not try to remove one across too many details. It is best to move it perpendicular to lines that are real details.

The change to target brush can be used to put in colors selected from nearby areas. Finally the paint brush can be used to brush away hard to get rid of white spots. Start with low opacity and use multiple brushing until you get what looks good. This was used on the interior panes of the windows.

Some of the noise was reduced using "Colormancer Freeware Boundary Noise Reduction". And some small spots had to be removed by hand. The red-eye remover was also used.

Finally, the color restoration is usually a bit conservative and doesn't give accurate saturation. A modest amount of increased color vibrancy makes the photo look better. So here are the results:

More passes of Focus Magic might help achieve more sharpness, but there was a small problem. The two initial passes brought out some of the patterning in specific details. The last pass suppressed it.

All of the various products I used are available at a reasonable cost. It is possible to just use the Freeware Boundary Noise Reduction and focus magic to get rid of most of the patterning, but it causes smearing on some edges and results in overall poorer detail. Neat plug-in also will reduce the patterning, but not always eliminate it. There are probably other workarounds to partially remove patterning, but

There used to be a Kodak product "Digital ROC" which was the best color restoration plug-in, but it is no longer available as a separate product. It may still be built into some scanner software.

Many photo editors have sharpening features, but in my experience Focus Magic works better. The built in routines are pretty good for just small amounts of sharpening. I have even tried the Photoshop sharpening routines, and they do not seem to work as well. There are a couple of problems with Focus Magic. The automatic detection doesn't always work well so try different details, or pick the width yourself by eye. Sharp transitions from light to dark may produce thin lines parallel to objects edges. These can be readily removed by hand, but will only be seen in large blowups.

Some pictures that have severely faded will have color blotches that can be edited out using the change to target tool. This often happens at the edges. Changing the color with multiple passes at low opacity is recommended. Be prepared to undo, and start over several times until you get it right.

ImageJ follows a different sequence from Affinity Photo.

1. Load the photo into ImageJ
2. Then click on Process/FFT/FFT
3. This creates the FFT map. The paintbrush tool is used to blacken the bright spots. To change the width double click on the paint brush icon. The color must be black.
4. To zoom in Ctrl-+ may be used. The hand tool can be used to move it around
5. Finally click on Process/FFT/Inverse FFT
6. A new window is created with the denoised image.
7. You can then save the new image.

Theoretically you do not need to blacken all of the bright spots. You only need to blacken all of them on one side of one of the axes, but often you can see spots on one side, but not the other, so blackening all is advisable. The central spot is always left alone, unless you wish to create a special effect.

It is possible to use the FFT editor to create special effects in ImageJ. The other editor features appear to be fairly simple compared to others such as Gimp, Paint Shop Pro, or Photoshop. At present 2019 there is no one consumer editor which satisfies all needs. Ease of use is to a certain extent in the eye of the user, but Paint Shop Pro has easier controls than Photoshop, while lacking a few features. Gimp is free and is undergoing development. For FFT processing, the real time feature of Affinity is wonderful, but the need to readjust the width with each new picture is a pain, and the lack of zoom makes it useless for some images. ImageJ as well as Affinity are available for several operating systems.

Links:

http://www.focusmagic.com/

https://affinity.serif.com/en-gb/photo/

https://imagej.nih.gov/

http://www.colormancer.com/free/download-filters/noise-reduction.htm

https://ni.neatvideo.com/home